Claims:

1. Vibration sensor for monitoring the state of rotating components or bearings, with a sensor element (3), with evaluation electronics (4) and with at least one interface (5, 6), the evaluation electronics having an analog/digital converter (7) and a signal conditioning means (8) and in the signal conditioning means (8) a plurality of signals which have been acquired by the sensor element (3) being converted into a state value using signal analysis and a diagnosis algorithm.

2. Vibration sensor as claimed in claim 1, wherein the sensor element (3), the evaluation electronics (4) and the interface (5, 6) are located in a common housing (2).

3. Vibration sensor as claimed in claim 1 or 2, wherein there are a display means (9) with a display (10) and with at least one control element (11, 12, 13) for parameter input and/or for setting the boundary values and/or for choosing the operating mode.

4. Vibration sensor as claimed in claim 3, wherein the display (10) has a color display, preferably with the color values green, yellow, red.

5. Vibration sensor as claimed in claim 3 or 4, wherein the control element (11, 12, 13) can be locked or blocked mechanically and/or electronically.

6. Vibration sensor as claimed in one of claims 1 to 5, wherein the interface (5, 6) has at least one switching output, a parameterization input and a current and voltage supply input.

7. Vibration sensor with two interfaces as claimed in claim 6, wherein the first and/or the second interface (6) has one signal input for a signal for example of an external sensor and wherein the second interface (6) has a current and voltage supply output for an external sensor, for example, a proximity switch.

8. Vibration sensor as claimed in one of claims 1 to 7, wherein there is at least one memory (19, 20) which is connected to the evaluation electronics (4), and parameter values and/or boundary values can be stored in the memory (19, 20).

9. Vibration sensor as claimed in one of claims 1 to 8, wherein the interface (5) has two switching outputs, the one switching output triggering preferably a pre-alarm and the other switching output triggering the main alarm.

10. Vibration sensor as claimed in one of claims 1 to 9, wherein the evaluation electronics (4) has self-learning logic.

11. Vibration sensor for monitoring the state of several rotating components or bearings as claimed in one of claims 1 to 10, wherein the state value of the component or of the bearing with the highest degree of damage (=poorest state value) is at the switching output.

12. Vibration sensor as claimed in one of claims 2 to 11, wherein the sensor element (3) is located on a circuit board which has at least one rigid segment (24) and at least one flexible segment (25).

13. Vibration sensor as claimed in one of claims 2 to 12, wherein the sensor element (3) is mounted in the housing (2) near the mounting site of the vibration sensor, especially with low attenuation.

14. Vibration sensor as claimed in one of claims 1 to 13, wherein a biaxial acceleration sensor is used as the sensor element (3).

15. Vibration sensor as claimed in claim 14, wherein the acceleration sensor is located at an angle of 45 degrees to the surface normal on the circuit board and wherein the output signals of the two channels of the acceleration signal are added.

16. Vibration sensor as claimed in one of claims 2 to 15, wherein the housing (2) is made roughly cuboidal and has a beveled top side (21), and wherein in the beveled top side (21) the display means (9) is integrated.

17. Vibration sensor as claimed in one of claims 2 to 16, wherein the housing (1) consists of metal, especially aluminum, or of plastic and meets at least degree of protection IP 65.

18. Process for monitoring the state of rotating components or bearings with a vibration sensor which has a sensor element and evaluation electronics, the signals which have been acquired by the sensor element being converted into a state value using signal analysis and a diagnosis algorithm.

19. Process as claimed in claim 18, wherein signal analysis takes place both in the time domain and also in the frequency domain.

20. Process as claimed in claim 18 or 19, wherein signal analysis take place based on a Fourier transform (FT), a fast Fourier transform (FFT) or an envelope curve fast Fourier transform (HFFT).

21. Process as claimed in claim 19 or 20, wherein dynamic quantitative averages and peak values are computed in the time domain.

22. Process as claimed in one of claims 18 to 21, wherein in the frequency domain the values which are supplied to signal analysis are manipulated, i.e. individual signals are weighted and/or filtered and/or windowed and/or modulated.

23. Process as claimed in claim 22, wherein the boundary values of filtering are variably set depending on the operating conditions.

24. Process as claimed in one of claims 18 to 23, wherein the diagnosis algorithm takes place depending on the stored and/or computed parameterization data and boundary values.

25. Process as claimed in one of claims 18 to 24, wherein using a diagnosis algorithm, individual signals are combined into characteristic values and the characteristic values are compared to boundary values, the individual signals being weighted according to their relevance.

26. Process as claimed in claim 25, wherein when a bearing consisting of an inside ring, an outside ring and a roller body is being monitored, the signals of the inside ring and of the outside ring and/or of the inside ring and of the roller body and/or of the outside ring and of the roller body and/or of the inside ring, then outside ring and the roller body are combined into characteristic values.

27. Process as claimed in claim 25 or 26, wherein the individual characteristic values are optionally combined with consideration of different weighting and with consideration of the operating state into a state value.

28. Process as claimed in one of claims 18 to 27, wherein the characteristic values and/or the state value is subjected to plausibility checking so that measurement errors are recognized and do not lead to a faulty state value.

29. Process as claimed in one of claims 18 to 28, wherein in the teach-in mode the boundary values are automatically computed depending on the parameterization data and the current operating conditions.

30. Process as claimed in one of claims 18 to 29, wherein at the start of monitoring of the state the response characteristic between the rotating component or the bearing and the vibration sensor is determined.

31. Process as claimed in claim 30, wherein at least one defined pulse in the three-dimensional vicinity of the rotating component or the bearing is fed into the machine and wherein a response characteristic is determined from the signal which has been measured by the vibration sensor.

32. Process as claimed in one of claims 24 to 31, wherein the parameterization data are automatically generated from a graphic and/or tabular model description of the machine, components or bearings to be monitored.

33. Process as claimed in one of claims 24 to 32, wherein the input of the parameterization data takes place via the input unit, especially a computer or PC.

34. Process for monitoring the state of rotating components or bearings at different rpm as claimed in one of claims 18 to 33, wherein the boundary values are automatically matched to the respective rpm.

35. Process as claimed in claim 34, wherein the rpm are automatically detected and measured and are subjected to plausibility checking so that an error in the determination of the rpm can be detected and corrected.

36. Process as claimed in one of claims 29 to 35, wherein in the teach-in mode the boundary values are computed depending on the parameterization data at the operating rpm and self-learning evaluation logic automatically computes the boundary values at other rpm.

37. Process as claimed in one of claims 18 to 36, wherein the state values are continuously stored and based on the previously determined state values a computation of the expected time interval (remaining service life) until occurrence of damage which adversely affects the serviceability of the rotating component and/or of the bearing is determined.